

## Human Embryonic Stem Cell-Derived Cardiomyocytes for Patients with End Stage Heart Failure

### Grant Award Details

Human Embryonic Stem Cell-Derived Cardiomyocytes for Patients with End Stage Heart Failure

**Grant Type:** Disease Team Therapy Development - Research

**Grant Number:** DR2A-05394

**Project Objective:** To submit a well supported IND for a FIH trial of human embryonic stem cell derived cardiomyocytes (hESC-CM).

#### Investigator:

**Name:** Joseph Wu

**Institution:** Stanford University

**Type:** PI

**Name:** Deepak Srivastava

**Institution:** Gladstone Institutes, J. David

**Type:** Co-PI

**Disease Focus:** Heart Disease

**Human Stem Cell Use:** Embryonic Stem Cell

**Award Value:** \$19,060,330

**Status:** Active

### Progress Reports

**Reporting Period:** Year 1

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**Reporting Period:** Year 2

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**Reporting Period:** Year 3

**View Report**

**Reporting Period:** OM #1

**View Report**

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## Grant Application Details

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**Application Title:** Human Embryonic Stem Cell-Derived Cardiomyocytes for Patients with End Stage Heart Failure

**Public Abstract:** Patients with end-stage heart failure have a 2-year survival rate of only 50% with conventional medical therapy. This dismal survival rate is actually significantly worse than patients with AIDS, liver cirrhosis, stroke, and other comparable debilitating diseases. Currently available therapies for end stage heart failure include drug and device therapies, as well as heart transplantation. While drug and device therapies have proven effective at reducing symptoms, hospitalizations and deaths due to heart failure, new approaches are clearly required to improve this low survival rate. Organ transplantation is highly effective at increasing patient survival, but is severely limited in its potential for broad-based application by the very low number of hearts that are available for transplantation each year. Stem cell therapy may be a promising strategy for improving heart failure patient outcomes by transplanting cells rather than a whole heart. Several studies have convincingly shown that human embryonic stem cells can be differentiated into heart muscle cells (cardiomyocytes) and that these cells can be used to improve cardiac function following a heart attack. The key objective of this CIRM Disease Team Therapy proposal is to perform the series of activities necessary to obtain FDA approval to initiate clinical testing of human embryonic stem cell-derived cardiomyocytes in end stage heart failure patients.

**Statement of Benefit to California:** Coronary artery disease (CAD) is the number one cause of mortality and morbidity in the US. The American Heart Association has estimated that 5.7 million Americans currently suffer from heart failure, and that another 670,000 patients develop this disease annually. Cardiovascular disease has been estimated to result in an estimated \$286 billion in direct and indirect costs in the US annually (NHLBI, 2010). As the most populous state in the nation, California bears a substantial fraction of the social and economic costs of this devastating disease. In recent years, stem cell therapy has emerged as a promising candidate for treating ischemic heart disease. Research by our group and others has demonstrated that human embryonic stem cells (hESCs) can be differentiated to cardiomyocytes using robust, scalable, and cGMP-compliant manufacturing processes, and that hESC-derived cardiomyocytes (hESC-CMs) can improve cardiac function in relevant preclinical animal models. In this proposal, we seek to perform the series of manufacturing, product characterization, nonclinical testing, clinical protocol development, and regulatory activities necessary to enable filing of an IND for hESC-CMs within four years. These IND development activities will be in support of a Phase 1 clinical trial to test hESC-CMs in heart failure patients for the first time. If successful, this program will both pave the way for a promising new therapy to treat Californians with heart failure numbering in the hundreds of thousands, and will further enhance California's continuing prominence as a leader in the promising field of stem cell research and therapeutics.

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